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THE IMPACT OF PROJECTING MULTIDIMENSIONAL PREFERENCE FUNCTIONS

INTO OPERATIONAL MACROECONOMETRIC MODELS

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Abstract

For a preference function U(y), to be a proper representation of the community's well being, y should contain all relevant aspects of life and will therefore be of high dimension. In any analysis to support policy proposals this high dimensionality needs to be reduced to an operational setting. A policy problem is therefore studied in a projection of U(y) into some explicitly defined variables. In this paper it is shown how preference functions can be based upon interviews of political parties. This helps to highlight consequences often ignored.

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CONTENTS

1. INTRODUCTION

Many economic problems require the maximization of some preference function, given a model which describes definitions, technical constraints and reaction patterns of economic agents. Most studies concentrate on the improvement of the models, however, interest in preference functions is increasing.
For U(y) to be a proper representation of the community's well being, y should contain all relevant aspects of life and will therefore be of high dimension. Without a projection of such a preference function into a small number of crucial variables an operational model would not be possible. Most researchers are not aware that such a projection should affect our analysis and our a priori ideas on functions and parameters. We will show this by constructing preference functions from direct interviewing policy makers. The construction of these empirical preference functions follows earlier work in this field, e.g. Merkies and Nijman (1981, 1983), Van Daal and Merkies (1984) and Merkies and Hofkes (1986). The present paper draws heavily on the latter. The book by Van Daal and Merkies also gives references to the work with Vermaat, where particularities about data collection and intricacies involved are described. The basic assumption is that macro-economic preferences can be approximated by a quadratic function around the prevailing value of the arguments.
The direct interviewing refers to evaluations for various conceivable values of the arguments. Additional information is provided by the answers to questions about the optimal conditions as viewed by the interviewed. The mathematical framework, more extensively described in Merkies and Hofkes (1986) is sketched in section 2. The data, collected at the end of 1983, are described for the present purpose in section 3. The resulting preference functions for five Dutch political parties are described in section 4. This section also gives information on the sensivity of these functions with respect to some of the underlying assumptions. The implications of our findings are illustrated by the implied Phillips curve in section 5. Finally, section 6 summarizes.

2. PREFERENCES AND POSSIBILITIES

2.1 The specification of the preference function and the sources of information collected

A macro-economic policy problem can be formalized as:

$$\begin{aligned} &\max W(y,x) \\ &\text{s.t. } G(y,x,z) = 0 \end{aligned} \tag{2.1}$$

where y, x and z are vectors of targets, instruments (controls) and data respectively. The projection of W(y,x) in targets alone is written as U(y) and can be approximated by

$$U(y) = a_0 + a'y + \tfrac{1}{2}y'Ay \tag{2.2}$$

where the constant a_0, the row vector a' with n linear parameters a_i and A, the positive definite matrix of quadratic parameters a_{ij}, may depend upon the prevailing situation y^*.
To estimate the parameters of (2.2) we need observations. We have for each policymaker two sources of information. Our first source consists of N different (n+1)-tuples $(U_{ij}, y_{1i}, \ldots, y_{ni})$ containing for each $i=1,\ldots,N$ an imaginary policy program $(y_{1i}, \ldots, y_{ni})$ and the evaluation U_{ij} of policymaker j of this program. The actual programs chosen and enquirees approached will be described in section 3 below. With the given information a regression equation for any j appears of the form

$$U = Y\beta + \varepsilon \tag{2.3}$$

where U is a vector of N indices, Y is an N×(K+1) matrix with typical row $[y_{i1}, y_{i2}, \ldots, y_{in}, y_{i1}^2, \ldots, y_{in}^2, y_{i1}y_{i2}, \ldots, y_{i(n-1)}y_{in}]$ containing the policy programs, β is a columnvector of K+1 parameters and ε is an N-vector of errors, indicating improper introspection of the evaluation. To save notation we dropped the index j, attached to U and β.

Introduction of a matrix A without any restriction would imply too many parameters, viz. $K=(n^2+3n)/2$ ($(n^2+n)/2$ quadratic parameters a_{ij}

and n linear ones a_i). In view of the reluctance of the enquirees to answer questionnaires with much more than 25 programs the estimation is not possible unless restrictions are introduced. Therefore the matrix A is restricted to be diagonal. Hence K is taken as 2n. The vector β is estimated as

$$\bar{\beta} = [Y'V^{-1}Y]^{-1} Y'V^{-1}U. \tag{2.4}$$

The variance-covariance matrix of ε is specified as

$$\sigma^2 V = \sigma^2 \mathrm{diag}(p_1^{-2}, \ldots, p_N^{-2}) \tag{2.5}$$

with p_i a weight indicating the carefulness with which policy program y_i is evaluated. The diagonality of the matrix V reflects the plausible assumption that each policy program is evaluated independently. The weights express the idea that if a program is considered "odd" or its probability p_i to occur low no serious attempt is made to quantify U_i, leading to a large variance of ε_i. This approach arose from the refusal of some enquirees to answer on "odd" programs. Weights p_i are assumed to decrease with the distance of y_i from the prevailing situation y_i^*. This assumption on V will be discussed in more detail in section 2.2.

A second source of information is obtained as follows. The optimal value of U(y) is attained at

$$\frac{\partial U(y)}{\partial y} = -a - Ay = 0. \tag{2.6}$$

The solution to this equation is indicated by $\tilde{y}$. Asking the enquirees to indicate the optimal value of their targets provides the value y^0. The difference

$$\delta = \tilde{y} - y^0 \tag{2.7}$$

substituted into (2.6) gives:

$$a + Ay^0 + v = 0 \tag{2.8}$$

with $v=A\delta$ a vector of length n. Equation (2.8) rewritten in observational form

$$R\beta + v = 0 \tag{2.9}$$

is added as a restriction to (2.3). Note that R is an $n\times(2n+1)$-matrix so that (2.9) puts a constraint on the parameters for each of the n optimal values y_i^0. The estimation problem can be solved by combining (2.3) and (2.9) into

$$\begin{bmatrix} U \\ 0 \end{bmatrix} = \begin{bmatrix} Y \\ R \end{bmatrix}\beta + \begin{bmatrix} \varepsilon \\ v \end{bmatrix} \tag{2.10}$$

and assuming for the errors zero expectation and a variance-covariance matrix given by

$$\mathrm{cov}\begin{bmatrix} \varepsilon \\ v \end{bmatrix} = \begin{bmatrix} \sigma^2 V & 0 \\ 0 & \lambda\sigma^2 V_0 \end{bmatrix} \tag{2.11}$$

where λ is an indicator that relates the two sources of information. The parameters are estimated by

$$\hat{\beta}_\lambda = [Y'\ V^{-1}Y + (1/\lambda)R'V_0^{-1}R]^{-1}\ Y'\ V^{-1}U \qquad \text{if } \lambda\neq 0 \tag{2.12}$$

and by

$$\hat{\beta}_\lambda = \bar{\beta} - Y'V^{-1}YR'\ [R'Y'V^{-1}YR]^{-1}\ R\bar{\beta} \qquad \text{if } \lambda=0 \tag{2.13}$$

with $\bar{\beta}$ the estimator from (2.4).
The components of $\hat{\beta}_\lambda$ rearranged as $\hat{a}$ and $\hat{A}$ give the estimated optimum as $\hat{y} = -\hat{A}^{-1}\hat{a}$ (see (2.6)), which for $\lambda\neq 0$ clearly differs from both the "true" optimum $\tilde{y}$ and the revealed optimum y^0.

The value of λ is of special interest. If only information on the evaluation of the programs is collected, y^0 does not exist and we may take $\lambda\to\infty$ in which case (2.12) reduces to (2.4) and therefore $\hat{\beta}_\lambda\to\bar{\beta}$. Such information is shown to be insufficient to generate adequate preference functions, as it is not considered seriously enough by the enquirees. On the other hand, if political parties are only willing and able to provide their values of y^0 (strategies of revelation ignored) the measurement of a preference function is not possible. Therefore, it is useful to persuade parties to provide also the first source of information. We may proceed by choosing $\lambda=0$ to avoid that the measurement of the preference function affects the implied value of the optimum $\delta=0$, but a value of λ from the open interval $(0,\infty)$ is usually more proper. The element still to be explained is the variance-covariance matrix V_0, indicating the precision with which the optimal values are provided. We assume:

$$V_0 = \mathrm{diag}(\sigma_1^2,\ldots,\sigma_n^2) \tag{2.14}$$

with σ_j^2 the variance of the variable y_j over the past, expressing the idea that the more volatile a variable y_j has been in the past, the more difficult it will be to specify its optimal value y_j^0.

In the analysis given above it is tacitly assumed that the global preference function $W(y,x)$ is differentiable in y^*. This allowed us to work with symmetric approximation (2.2). Differentiability in the entire domain of y was assumed to obtain (2.6). In view of this asymmetric preference functions fall outside the scope of this paper.

2.2 How real are the scenarios

Before we ask an enquiree to evaluate a policy program i, we attach a weight p_i to it indicating its probability to occur. If such probabilities are too low the enquirees are not willing to answer. The probabilities are derived from a forecasting model, described in more detail in Merkies and Nijman (1981, 1983), and specified as:

$$y_t = \delta + t\gamma + t^2\alpha + \eta_t \tag{2.15}$$

y_t is a vector of length n at time t; δ, γ and α are vectors of parameters of length n and $\eta_t \approx IN(0,\Sigma)$ is a stochastic vector of length

n, which is independent of time.
If we have a sample of length T, a simultaneous forecasting interval for some τ years ahead can be constructed according to

$$\frac{T-r-n+1}{(T-r)n} e_\tau' \hat{\Omega}^{-1} e_\tau = F_\alpha(n,T-r-n+1) \qquad (2.16)$$

e_τ is a vector with n forecasting errors in year τ with variance-covariance matrix

$$\hat{\Omega} = (\mu+q_\tau)S \qquad (2.17)$$

where S is the estimate of Σ and $q_\tau = X_\tau'(X'X)^{-1}X_\tau$ with $X_\tau' = [1,\tau]$. The parameter μ which we will generally refer to as "the degree of uncertainty of the future" is the ratio of the variance of the future to that in the past. For given α, probability-contours can be constructed from (2.16). Inversely, each scenario y_i can be considered as a realization in year $t+\tau$, so that its forecasting error – its difference with the forecast from (2.15) – can be computed and its α%-probability of excess – indicated by p_i – can be derived from (2.16).

Apart from these probabilities p_i we also ask the enquirees themselves to evaluate the realism of a policy program. This can be done only after a set of programs is specified. The computation of probabilities p_i helps to select a proper set of policy programs in advance. The diagonal elements of the matris S help to specify the matrix V_0 in (2.11) if we assume that the accuracy with which the optima $\bar{y}$ are evaluated is related to the variance of the variables in the past.

3. THE INQUIRY; DESIGN AND RESULTS

3.1 The enquirees

We held an inquiry among political parties, more specifically among their representations in the "Tweede Kamer der Staten-Generaal" (Parliament). Those who provided answers that could be processed are mentioned in table 1 together with the number of seats they held in that chamber.

Table 1. The political parties inquired*

		Number of seats
CDA	Christian Democrats	45
VVD	Liberals	36
PvdA	Labour Party	47
D'66	Democrats	6
GPV	Reformed Political Association	1
Total number of seats in participating parties		135
Total number of seats in Lower Chamber		150

* A coalition of CDA and VVD as in power during this period.

The questions concerned a set of 25 "policy programs" (N=25). Each program refers only to the values of five policy variables (n=5). A set provides two sources of information; first the evaluation U_{ij} of party j on each of the 25 programs and secondly the content of the optimal program of party j. We collected information on two different sets of policy programs, A and B.

3.2 Policy variables; set A

The policy variables of set A are:

y_1 = registered *unemployment* of the dependent working population according to the definition introduced in CEP 1983

y_2 = *growthrate* of real NNP

y_3 = percentage increase in the *price-index* of wage-earners' family expenditure

y_4 = borrowing requirements of the Government (as a percentage of NNP)

y_5 = balance of payments of current account (as a percentage of NNP).

The 25 possible scenarios for 1987 of these variables are given in tabel 2a. The information asked for is indicated by dots. The first source of information concerns the evaluations of the programs in the column indicated by U, the second source is the specification of the optimal program in the first row. Hence this row (= y^0) differed among the parties.

Table 2a. Scenarios for 1987: set A

i	U	y_1	y_2	y_3	y_4	y_5	p[1]
1	100	..	..	..	..	..	...
2	...	16	−1	7	13	2	100
3	...	12	2	8	9	2	78
4	...	16	2	7	14	2	99
5	...	16	−5	7	14	2	100
6	...	16	−2	9	14	2	100
7	...	16	−2	4	14	2	100
8	...	16	−2	7	14	−1	95
9	...	16	−2	7	14	5	94
10	...	12	−2	7	14	2	62
11	...	18	−2	7	14	2	98
12	...	16	−2	7	9	2	66
13	...	16	−2	7	17	2	82
14	...	14	−2	7	9	2	81
15	...	16	−2	8	9	2	64
16	...	12	1	5	8	2	61
17	...	18	−3	7	9	3	44
18	...	17	0	4	9	4	70
19	...	20	1	3	10	5	58
20	...	16	2	3	13	4	94
21	...	16	3	3	10	4	87
22	...	16	2	2	10	4	84
23	...	16	2	3	10	0	77
24	...	10	2	3	10	4	16
25	...	16	2	3	7	4	42

1) Probability of occurrence, see text.

Scenario number 18 represented more of less*) the actual situation prevailing at the time of the inquiry (fall of 1983), hence $y_{18} \approx y^*$. The last column of table 2a refers to the probabilities p_i as described in section 2.2. To compute these probabilities we disposed of a sample of time series covering the period 1964-1983, so T=20 (years). In applying (2.15) we selected a quadratic trend for two variables only (i=1 and i=4). Hence for three out of five variables a regression with a linear trend was run for the period 1964 until and inclusive 1983; for the variables y_1 and y_4 a quadratic term of $\alpha_i t^2$ was added. To compute (2.16) we specified T=20, n=5 and r=3 (so ignoring that no quadratic term is included in 3 equations).

The parameters of (2.17) selected for the present study are

$$\begin{aligned} &\mu = 10 \qquad \text{(degree of uncertainty of the future)} \\ &\tau = 1 \qquad \text{(horizon of the enquiree)} \end{aligned} \tag{3.1}$$

The first value was found in the previous studies to be a reasonable compromise. It expresses the view that the degree of uncertainty of the future is ten times as great as suggested by the variance of our regression. The parameter τ, which we will refer to as the "horizon of the enquiree", is given a value of one to indicate that the enquirees considered these scenarios implicitly as to refer to 1985 (1 year ahead from the time of the inquiry). In other words the horizon of the evaluators was taken to be one year and not 3 years as suggested by the inquiry (see table 2a). The probabilities p_i were calculated, according to these rules, prior to the inquiry. Thus we could compile a set of scenarios of different degree of attainability. For instance, program 24 was thought to be so unrealistic that its probability to appear (or rather the probability that this program or a more odd vector in the same Cartesian direction would materialize in 1985) was thought to be only 16% and it seemed almost certain that situation 2, 5, 6 or 7 would arise, indicating that an inflation of 9% (alt 6) was

*) The measurement of the "actual" situation is not unambiguous. It depends upon the time of measurement. It remains always possible that more recent information gives corrections on earlier estimates. Moreover, measurement errors always remain.

considered as equally likely as an inflation of 4% (alt 7) and more or less the same view existed with respect to a decreased growth of 1% (alt 2) or of 5% (alt 5).

There are some points worth noting concerning these probabilities:

1. The probabilities of table 2a are calculated with (2.16) and therefore of a mechanical character. They were needed prior to the inquiry to assure sufficient variety in the set of scenarios.

2. Parties' views on the reality of the scenarios were also asked for. They were quite different, see table 3. Only the Democrats' views were positively correlated (r=.20) with the mechanically obtained probabilities.

3. Ex post comparison between the mechanical and the parties' views revealed that changing the "degree of uncertainty of the future" μ or the "horizon" τ would not have improved the correlation, see table 3.

4. It is of interest to see how the parties looked upon the reality of their own preferred plans, see table 4.

5. Ex post the real situations for both 1984 until 1987 can be added for comparison. We have:

	y_1	y_2	y_3	y_4	y_5
1984	17	2	3	9	5
1985	16	2	3	7	5
1986	15	3	0	6	3
1987	14	1	0	8	2

Table 3. Correlation between parties' and mechanical views on scenarios: set A

	Parties' estimates				computed estimates			
					$\tau=1$		$\tau=2$	
	CDA	VVD	PvdA	D'66	$\mu=10$	$\mu=15$	$\mu=10$	$\mu=15$
CDA	1.00	0.80	0.68	0.33	-0.46	-0.40	-0.61	-0.57
VVD	0.80	1.00	0.78	0.13	-0.54	-0.52	-0.62	-0.63
PvdA	0.68	0.78	1.00	0.00	-0.36	-0.31	-0.41	-0.38
D'66	0.33	0.13	0.00	1.00	0.20	0.25	-0.07	0.02

Table 4. Preferences of political parties and the chances to realize them: set A

	Programs y^0					Probabilities		
	y_1	y_2	y_3	y_4	y_5	parties own	$\mu=10$ $\tau=1$	$\mu=15$ $\tau=1$
CDA	12.0	3.0	3.0	7.0	2.75	0.90	0.41	0.60
VVD	5.0	2.5	3.0	2.5	2.0	0.00	0.02	0.06
PvdA	14.0	3.0	4.0	9.0	3.0	0.25	0.78	0.88
D'66	4.0	5.0	2.0	3.0	1.0	0.00	0.02	0.06
GPV	10.0	3.0	10.0	6.5	3.0	1)	0.14	0.29

1) No information given.

3.3 Policy variables; set B

The variables of the second set are:

y_1 = registered *unemployment* of the dependent working population according to the definition introduced in CEP 1983.

y_3 = percentage increase in the *price-index* of wage-earner's family expenditure.

y_6 = *Public share* in net national income.

y_7 = *Labour share* in net national income.

y_8 = *(competitiveness)* difference in percentage increase in real unit labour costs (in guilders) between the Netherlands and its competitors.

The scenarios of set B were designed similarly to those in table 2a.

No one was near to the realized view on 1985. Probabilities were computed as before, a quadratic term was selected only for variable y_1. Again we specified T=20, n=5 and r=3 (ignoring zero parameters of quadratic terms). Again we choose μ=10 and τ=1.

Table 5. Correlation between parties' and mechanical views on scenarios: set B

	Parties'estimates				Computed estimates			
					τ=1		τ=2	
	CDA	VVD	PvdA	D'66	μ=10	μ=15	μ=10	μ=15
CDA	1.00	0.15	0.21	0.15	-0.46	-0.48	-0.53	-0.59
VVD	0.15	1.00	0.83	-0.36	-0.39	-0.34	-0.53	-0.52
PvdA	0.21	0.83	1.00	-0.13	-0.37	-0.35	-0.47	-0.47
D'66	0.15	-0.36	-0.13	1.00	0.51	0.49	0.42	0.43

Table 5 again shows mainly negative correlations between the mechanical probabilities and those the parties attached to the different programs.

The optimal vectors of the parties and their probabilities are given in table 6.

Table 6. Preferences of political parties and the chances to realize them: set B

	programs y^0					probabilities		
	y_1	y_3	y_6	y_7	y_8	parties own	μ=10 τ=1	μ=15 τ=1
CDA	12	3	57	85	2	0.90	0.25	0.44
VVD	5	3	50	80	0	0.00	0.00	0.01
PvdA	14	4	57	84	2	0.25	0.19	0.37
D'66	4	2	58	85	-1	0.00	0.09	0.21
GPV	10	0	56	85	2	1)	0.15	0.30

1) No information given.

4. THE ESTIMATED FUNCTIONS

4.1. The variables of set A and set B

Preference functions can be estimated if one is willing to accept parties' evaluations of our programs as sensible information. As soon as some positive value is attached to λ preference functions can be better estimated but the optimal y^0 from tables 4 (and 6) is affected. This will be replaced by estimate $\hat{y}^0$. The choice of λ is a subjective matter as indicated above, but there are some objective elements involved. If λ gradually increases from zero to larger positive values it may happen that the estimation procedure fails to generate a negative semi-definite Hessian matrix A. Then at least for one variable the vector $\hat{y}^0$ does not indicate maximum utility! This clearly sets a limit value to λ. In Merkies and Hofkes (1986) extensive results for various λ are shown. Here we give only results for λ=0.001 and parties own weights (see tables 7 and 8).

Table 7. Estimates of preference functions with parties' own weights: set A

party	a_0	a_1	a_2	a_3	a_4	a_5	$\frac{1}{2}a_{11}$	$\frac{1}{2}a_{22}$	$\frac{1}{2}a_{33}$	$\frac{1}{2}a_{44}$	$\frac{1}{2}a_{55}$
CDA	-11.14	-19.93	0.11	-4.55	-8.10	-3.25	-1.99	-0.01	-2.26	-2.02	-1.29
VVD	1.66	-2.43	4.98	-1.94	-10.28	1.22	-0.10	-1.00	-0.97	-0.79	0.30
PvdA	20.84	-4.90	8.84	0.03	0.03	-7.90	-0.80	-1.47	-1.29	-5.84	-3.94
D'66	-6.83	-10.68	2.04	0.40	-0.97	-1.85	-0.41	-0.20	0.10	-0.08	-0.31

Computed optima	y_1	y_2	y_3	y_4	y_5	U
CDA	12.0	10.70	2.99	7.00	2.74	91
VVD	5.01	2.50	3.00	2.50	1.99	86
PvdA	13.95	3.01	4.01	9.00	3.00	46
D'66	3.98	4.98	1.95	2.97	1.00	73

Table 8. Estimates of preference functions with parties' own weights: set B

party	a_0	a_1	a_3	a_6	a_7	a_8	$\frac{1}{2}a_{11}$	$\frac{1}{2}a_{33}$	$\frac{1}{2}a_{66}$	$\frac{1}{2}a_{77}$	$\frac{1}{2}a_{88}$
CDA	10.05	-3.15	-0.00	-1.72	-5.71	18.62	-0.39	0.19	-0.41	-0.95	-3.10
VVD	-0.04	-1.52	-0.00	-1.76	-7.26	2.75	-0.07	0.97	-0.10	-0.45	-1.38
PvdA	0.0	-112.86	-10.0	-5.0	-0.0	-8.57	-28.21	5.00	-1.25	-0.0	1.43
D'66	-0.03	-1.95	0.04	-0.74	0.03	-0.00	-0.08	0.02	-0.36	0.01	0.04

Computed optima	y_1	y_3	y_6	y_7	y_8	U
CDA	11.98	3.00	56.88	85.00	2.0	99.7
VVD	5.00	3.00	50.00	80.00	-0.0	106.7
PvdA	14.00	4.00	57.0	84.00	2.0	100
D'66	4.01	1.98	57.98	84.84	-1.0	11.98

4.2 Sensivity

The most striking feature of the result is that the computed optima $\hat{y}$ hardly differ from the revealed optima y_0 in tables 4 and 6. This is not surprising as parties' own weights are in general rather close to zero, which implies that such observations are more or less ignored in the computations. With so many weights close to zero the informational content of the first source shrinks away leaving the conclusions to depend only on information of source 2. This is also indicated by the U-values of the various optima which are much closer to 100 than those with mechanical weights. It is not surprising that the measured preference functions become rather unreliable as they depend only upon a very mutilated set of observations. The slight differences between computed and revealed optima must be handled with prudence. We have verified whether our conclusions were depending upon the weights. Table 9 gives for the variables of set A for each party and for each variable whether the computed optimum was above (+) or below (-) the revealed optimum if the mechanical weights were used. If the same feature was found with parties' own probabilities an asterisk (*) is attached to the indicated sign.

Table 9. Estimated optima higher (+) or lower (-) than revealed optima;
set A; modelweights (* does not change if parties' weights are used)

	y_1 unemployment	y_2 growth	y_3 inflation	y_4 govt. finance	y_5 balance of payments
CDA	-	+*	-*	-	-*
VVD	-*	+	-	-	+
PvdA	-*	+*	+*	-	-
D'66					
GPV	-	+	-	-	+

The hidden wish for higher growth rates and lower unemployment appears to be independent of the set of weights.
For the second set of variables sufficient information is lacking to construct a table.

4.3 Stability through time

Whether preferences are stable through time can be verified with the help of the variables of set B. In Merkies and Nijman (1983) preference functions on the same set of variables are discussed. They referred to 1977, the same procedure was followed and optima were computed in the same way. The results are reported in Merkies and Hofkes (1986) The remarkable point is that much lower unemployment figures were strived for in 1977. A saying often heard is: "Politics is the art to attain what is possible". The differences between computed and revealed optima vanish against differences over time. But this mainly concerns unemployment. Actual possibilities in the economy seem to be more important than preferences.

5. THE IMPLICATIONS

5.1 Preliminaries

We now turn to the implications of our computations. In our operational setting the multidimensionality of the preference function is reduced to only five dimensions. As it remains a difficult task to fancy the shape of a preference function even in five dimensions, we simplify further by looking to the projection in two variables only: the price-index and the rate of unemployment. To be impartial we aggregated the functions of the political parties into preferences of the community. It is common knowledge that the construction of such a community preference function is not possible in general, but it seems admissable for the restricted domain of the variables with which we are dealing here. The construction of such a function has the advantage that we can study the implications of preferences on economic developments. In reality power play among political parties decides over the preferences that are favoured in a particular period. But as long as preferences are not too different, one may expect that a weighted average – with weights reflecting Parliament representation – constitutes a reliable indication of the community's preferences. On these premises we have constructed the preference function of the Dutch community with respect to the two sets of variables discussed. The two functions are:

$$U = -4.25\ y_1 - 0.45\ y_3 - 0.48\ y_1^2 - 0.37\ y_3^2 \qquad (5.1)$$

$$U = -2.0\ y_1 - 0.01\ y_3 - 0.23\ y_1^2 - 0.10\ y_3^2 \qquad (5.2)$$

These two community preference functions can be handled in the same way as before. The optimal values for the two sets are:

Table 10

	set A	set B
unemployment	12.57	11.65
inflation	3.39	2.95

The indifference curves of the two quadratic preference functions are ellipsoids. Their projections for U-95 and U-99 (or 95% resp. 99% of the optimal value) are drawn in figure 1 (for set A) and figure 2 (for set B). The optimal points of table 10 are represented in the figures by a +sign and indicated by A.
Comparison of both figures shows that the projection depends upon the variables in the preference function that are suppressed. In both figures the symmetry axes of the ellipses are parallel to the main axes of the diagram. This is not coincidental but follows from the diagonality of the matrix A in (2.2). This was assumed to save degrees of freedom. Figure 1 and figure 2 suggest that it may not have been the most plausible assumption.
Apart from the indifference curves we have represented the possibilities in the figures. The point estimate of 1984, made with model (2.15) i.e. 14% unemployment and 6,5% inflation, is represented in both figures with a black box and indicated by B. We computed a 95% probability interval around this point in the way we also computed our probabilities in section 3. These intervals are ellipsoids in five dimensions. The projection is represented in the figures 1 and 2. As the variables suppressed in both preference functions are not the same the ellipses of the figures 1 and 2 differ. They are projections from two different five dimensional spaces. Note that these projections depend upon the values adopted for the suppressed variables.

Figure 1 Preferences and possibilities: set A

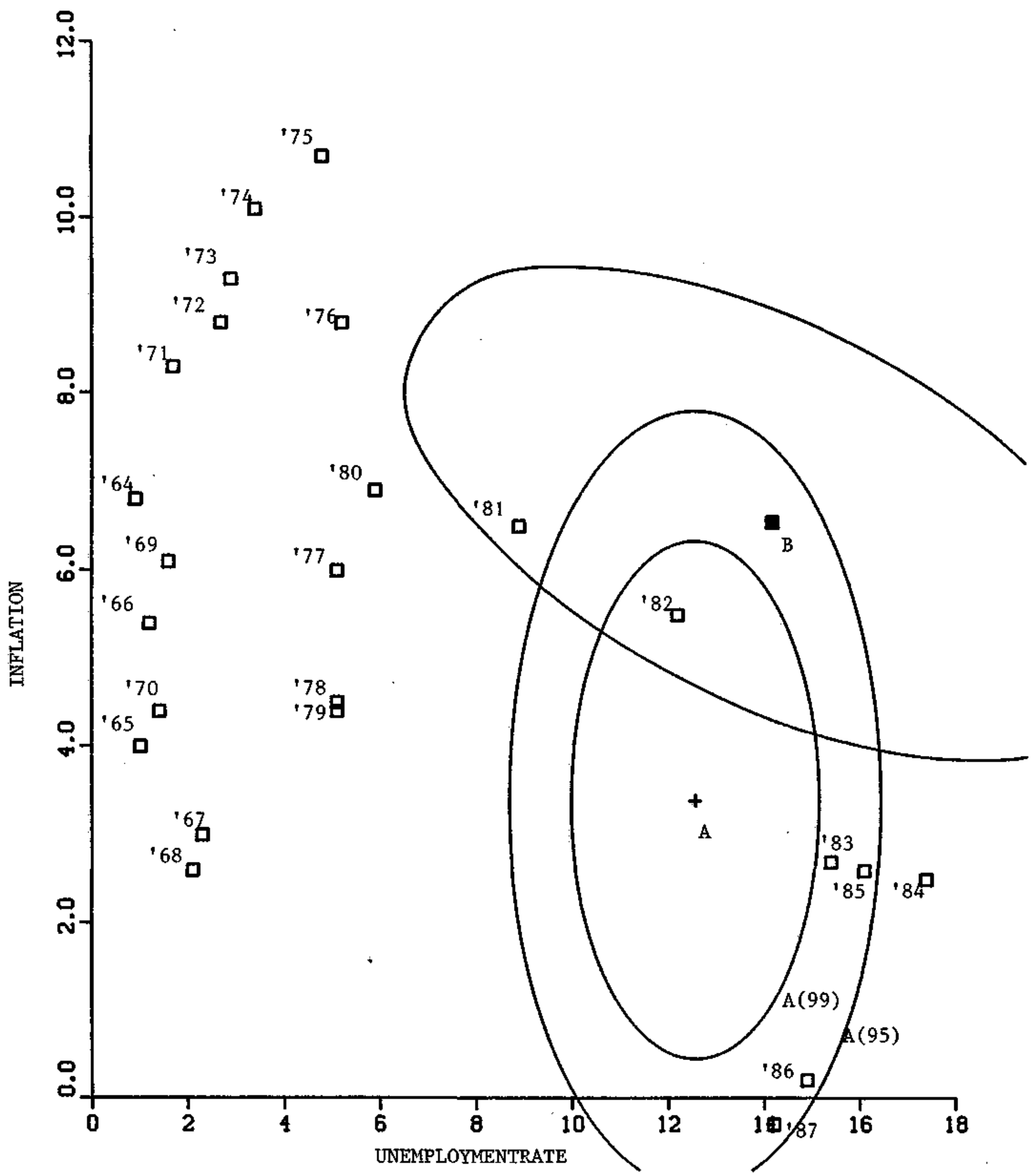
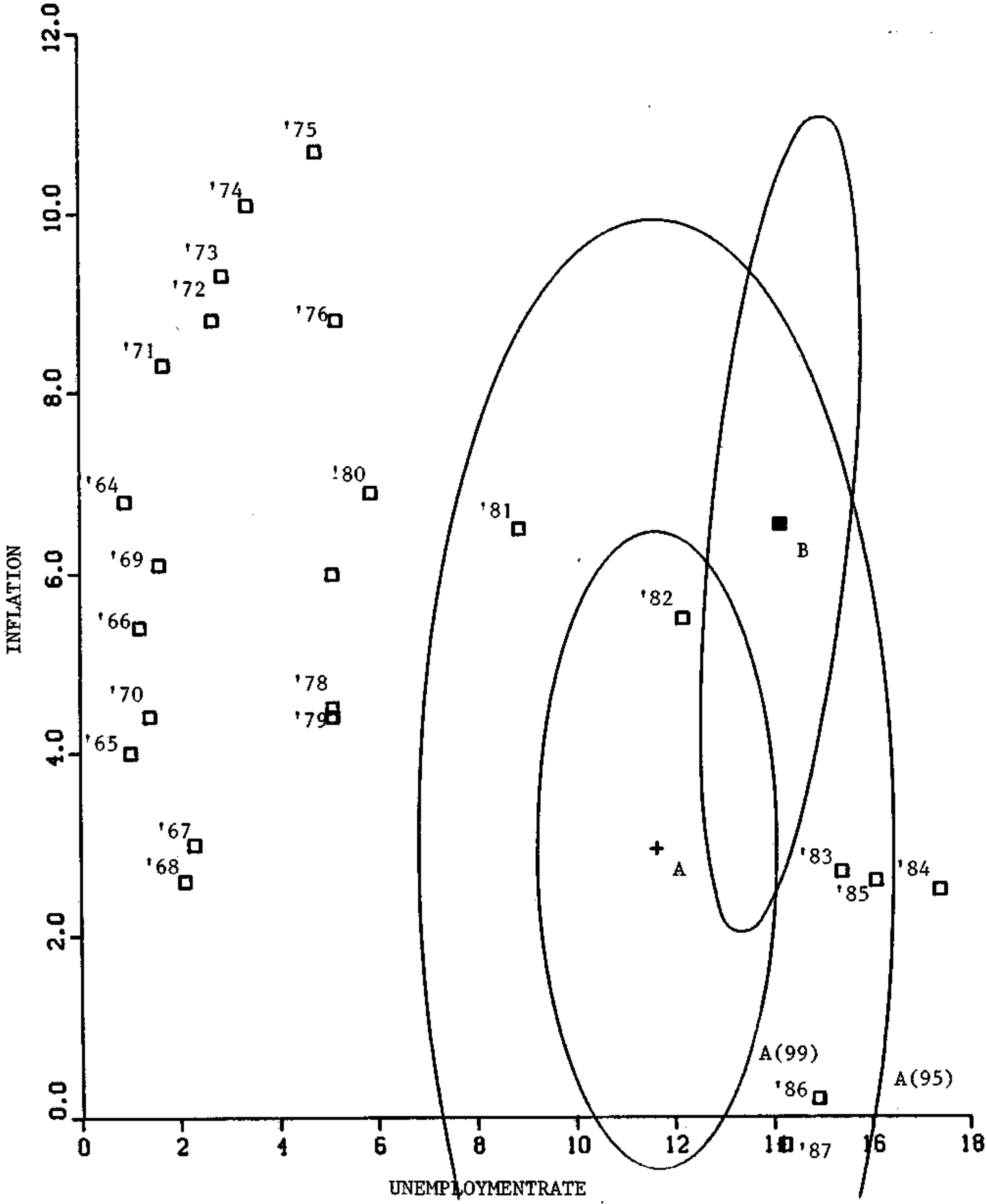


Figure 2 Preferences and possibilities: set B



If the weighted preference functions (5.1) and (5.2) reflect indeed the preferences of the collectivity and the possibility-ellipses are indeed true representations of what the economy allows, an optimal policy in the line of Theil (1968) can be constructed. The solution of the maximization of the preference function (5.1) and (5.2) subject to the quadratic constraints described by our ellipses leves one degree of freedom: the relation between ends and means. For given means the possibility-ellips is fixed and the optimal policy is obtained by varying the indifference ellips such that the two ellipses are tangent. The same solution can be obtained with a given indifference curve and a varying possibilities' ellips. The smaller we take this given indifference curve, the closer the optimal point will be to the community's optimum of table 10. It is clear that for different given indifference curves the optimal points will be on a curve that goes through both points A and B. A little geometry will indicate that this curve is only a straight line if both ellipses degenerate into circles. But although in general a variety of curves can appear, a glance at the figures shows that in our example the path between A and B is not far from a straight line.

5.2 <u>The Phillips curve</u>

We have selected the two variables inflation and unemployment to show some light on the significance of the Phillips-curve. Although the original form launched by Phillips (1958) connected money-wages with unemployment, the literature on this subject, see e.g. Desai (1984) often selects other representations of the concepts discussed. Whatever the actual choice of the variables, the underlying significance remains somewhat obscure. Few authors attempt to describe the true nature of the relation. Does it describe demand or does it describe supply? Is it the locus of clearing points of the labour market or is it the result of a disequilibrium solution? Whatever the true nature, we would like to know what the scatter diagram originally studied by Phillips reflects. Is it allowed as for instance done by Reuber (1964) to interpret the graph through the scatter by the community's indifference curve? To clarify the point we assume that usually the optimal policy as given by Theil is more or less attained. This assumption is not as bold as it seems. Authors who try to deduce community's preferences from revealed preference theory, see e.g. Friedländer (1973) do in fact the same.

In our framework the assumption would imply that, if neither preferences nor the economies' possibilities change the scatter of historical points would lie around the line-segment through A and B. The scatter of actual points in figure 1 and figure 2 shows that this is not the case. The points may be on a remote contour around A but they cannot be on a line-segment through A and B unless these points are also shifted.

We have no definite answers yet on the questions raised above. There are, however, various features that are worth to draw attention to:

1) Any curve through the scatter is a projection of a locus in higher dimensions. What differences this may cause is shown by the different positions of the possibilities curves in figure 1 and figure 2. The same may hold for the indifference curves if we allowed these to adopt skew positions (allowing non-zero off-diagonal elements in the Hessian matrix A).
2) The community's optimum at the time of the inquiry was completely different from what it had been before, when such high unemployment rates as observed lately were considered unacceptable. The figures suggest that preferences are rather influenced by short term opportunities of the economy!
3) The locus drawn through the historical scatter cannot be interpreted as an indifference curve. The indifference curve is neither a kind of hyperbola indicating higher utility the closer it is to the origin. The indifference curve is a rather unstable ellips around a point determined by the possibilities of the economy.
4) The historical scatter may be interpreted as an upward sloping curve representing the A-B graph of optimal points. If this interpretation is correct the fluctuation between ends and means decided over the actual situation between 1964 and 1983.

6. SUMMARY

In this paper we have made another attempt to measure preferences of Dutch political parties on economic issues. For this purpose an inquiry was held at the end of 1983. The answers were analyzed within the framework of a collective choice model. Parties were inquired about two sets of variables; the first referred to unemployment, growth, inflation, government financing and the balance of payments. The second to unemployment, inflation, distribution between public and private, distribution between labour and other income and finally international competitiveness. Parties were asked to indicate their target values on these variables for the period 1983-1987 and also to evaluate various alternative economic situations.

The information on the first set allowed us to measure quadratic preference functions for four political parties (Christian Democrats, Liberals, Socialists and Reformed Political Association). The same holds for the second set but for the Socialists. The answers of the fifth party – the Democrats – did not generate functions for either set.

This result as such indicates that it is at least formally possible to measure preference functions by inquiries. It appeared that evaluation of alternatives provides useful additional information on the indicated targets if parties confess consistent long term options. This was most clearly shown by the answers of the Liberals and somewhat less by the Reformed Political Association. Nevertheless the dominating result was that revealed targets in general heavily depend upon the actual state and possibilities of the economy. One may call this realism, modesty or myopia according to one's attitude. It may also indicate a weakness of the inquiry to clarify the difference between a long term goal and a partial achievement within a given time period.

With the computed preference functions alternative target values were generated. Comparison with values that were revealed is compiled in table 9. This shows that in general parties preferred higher growth rates, lower unemployment and more stringent borrowing requirements for the government than they were willing to admit.

Comparison of our results with earlier attempts supports the view mentioned above that preferences shift with actual opportunities of the economy. If this is true it affects the interpretation of certain relations in economic theory e.g. the Phillips-curve. The empirical relation between price increases and unemployment ratios can no longer be interpreted as an indifference-curve as e.g. done by Reuber (1964). The relation may indicate the opportunities of the economy, but our sample period (1964-1983) is probably too short to verify such a statement.

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